Challenges in Implementation of Bioassessment Monitoring for Municipal Programs in Arid Southern California

A Closer Look at the Environmental Conditions, Regulatory Thresholds, and Future Considerations

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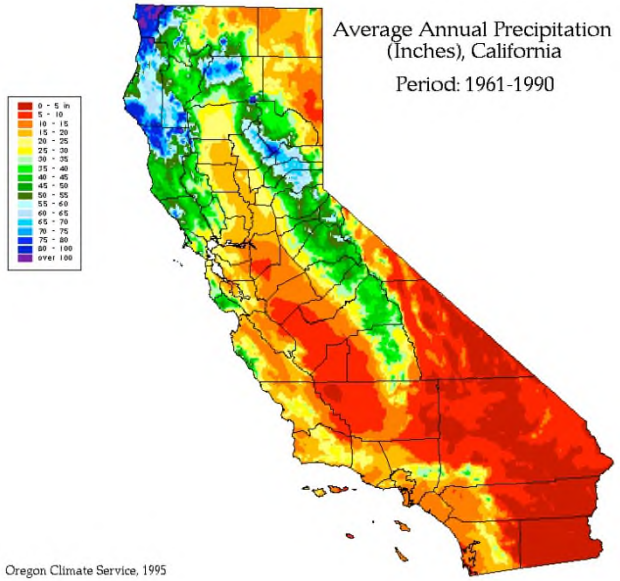
Climate in Southern California

- Southern California is a Mediterranean climate
  - Hot, dry summers / Mild, wet winters
  - Rainfall extremely variable
- Mean annual precipitation
  - Los Angeles: 14.7 inches
  - Orange: 13.8 inches
  - Riverside: 10.3 inches
  - San Diego: 10.1 inches
- Almost all rain (~83%) occurs November-March



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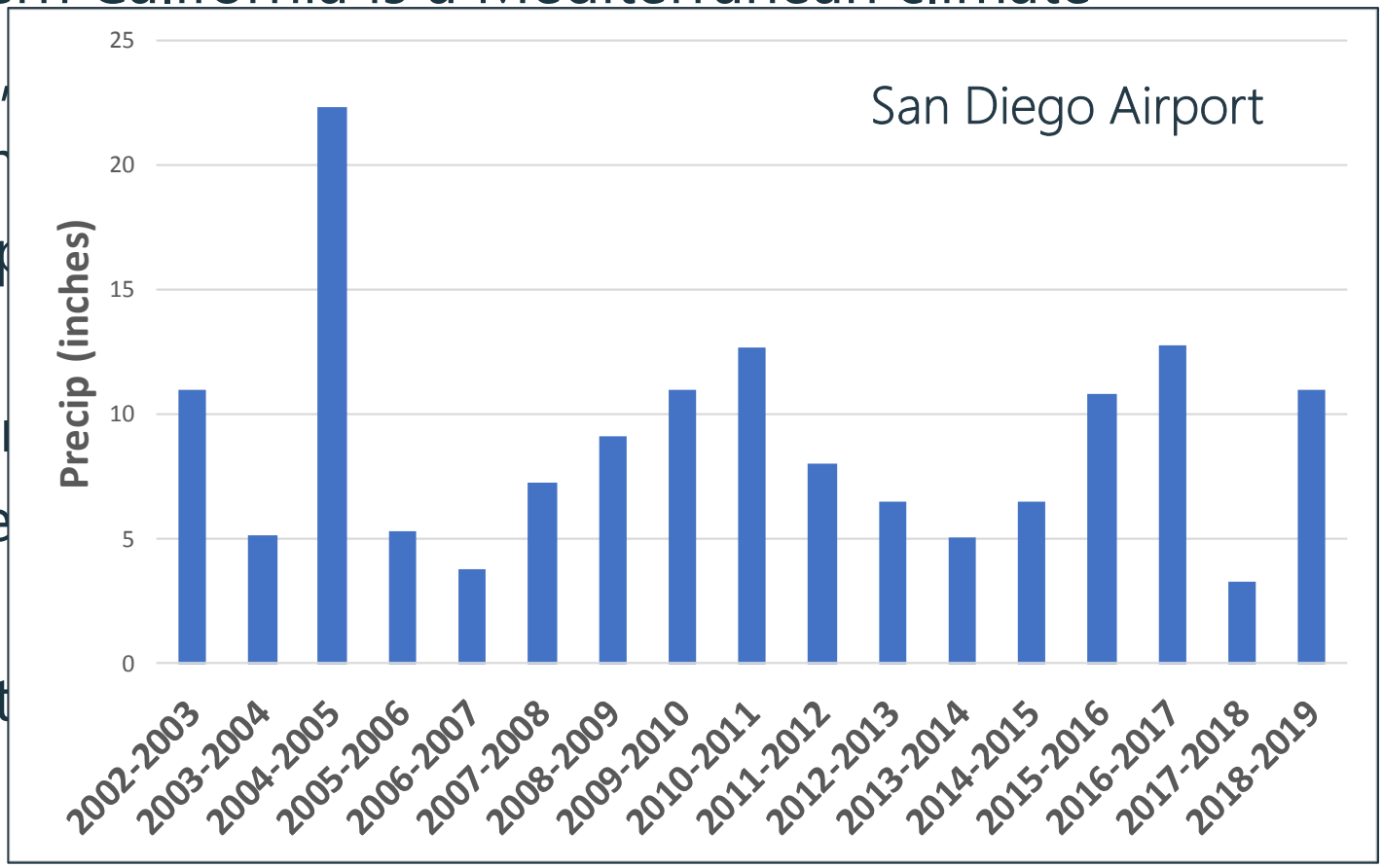

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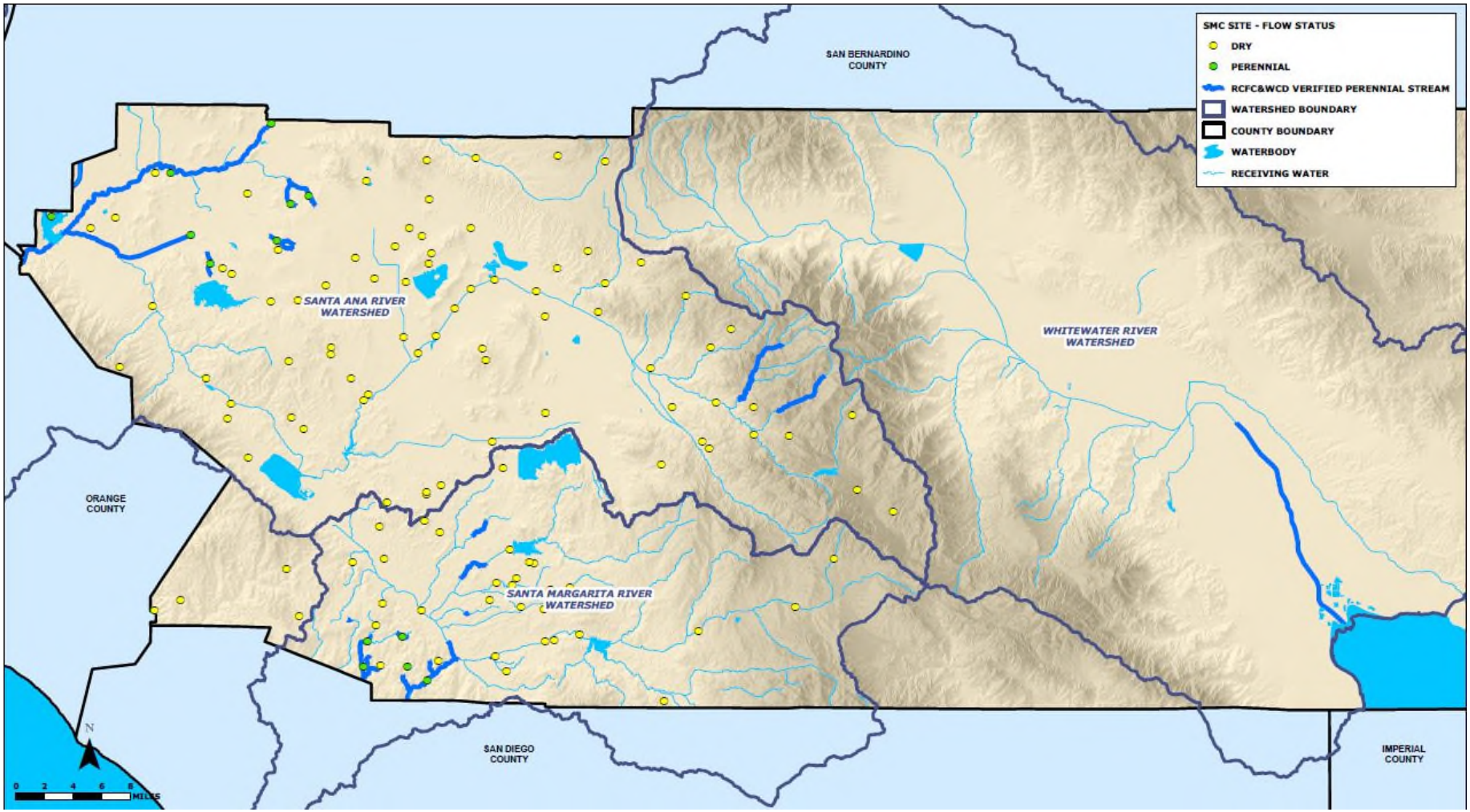
Ratio of Perennial vs Intermittent Streams

- High percentage of stream miles in Southern California are intermittent
  - 60% Region-wide
  - 73% in San Diego Region
  - 80% Riverside Region
- A fair amount of intermittent streams in the region will dry repeatedly over a single season

Riverside County, CA Stream Perenniality



Map courtesy of Michael Phipps, RCFC&WCD

Mazor et al (2014) Non-perennial Stream Study

- Sampled 12 streams multiple times across multiple years in the San Diego Region
- Gradient of low stress (Reference) to high stress (Ag & Urban) sites
- Examined a number of physical habitat factors and flow
- Results for non-perennial streams
  - IBI scores remained relatively stable across the drying cycle at low stress sites
  - Anthropogenic stress increased variability in IBI scores
  - Sharp decline in IBI scores at all high stress sites and some moderately stressed sites as streams dried

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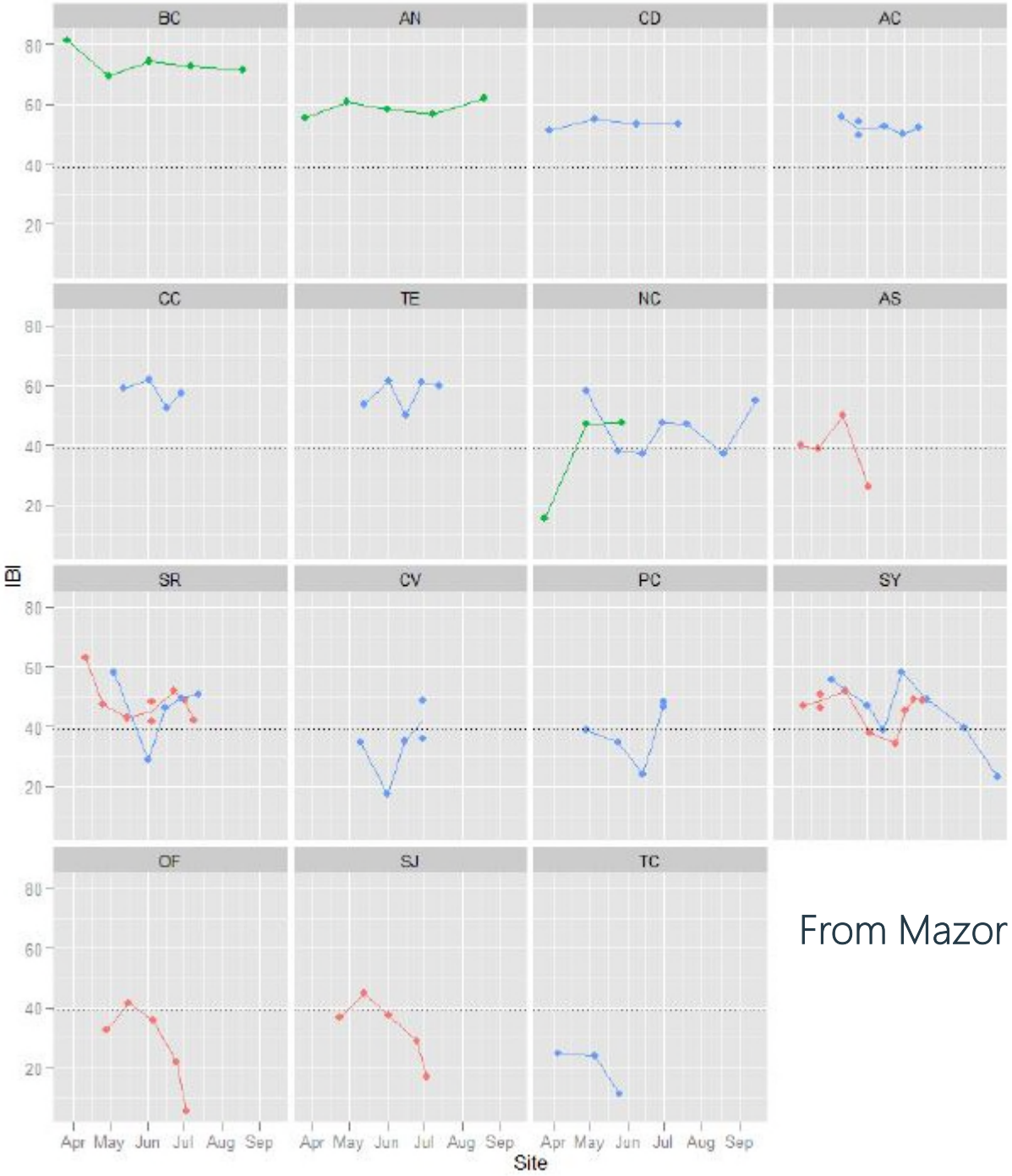
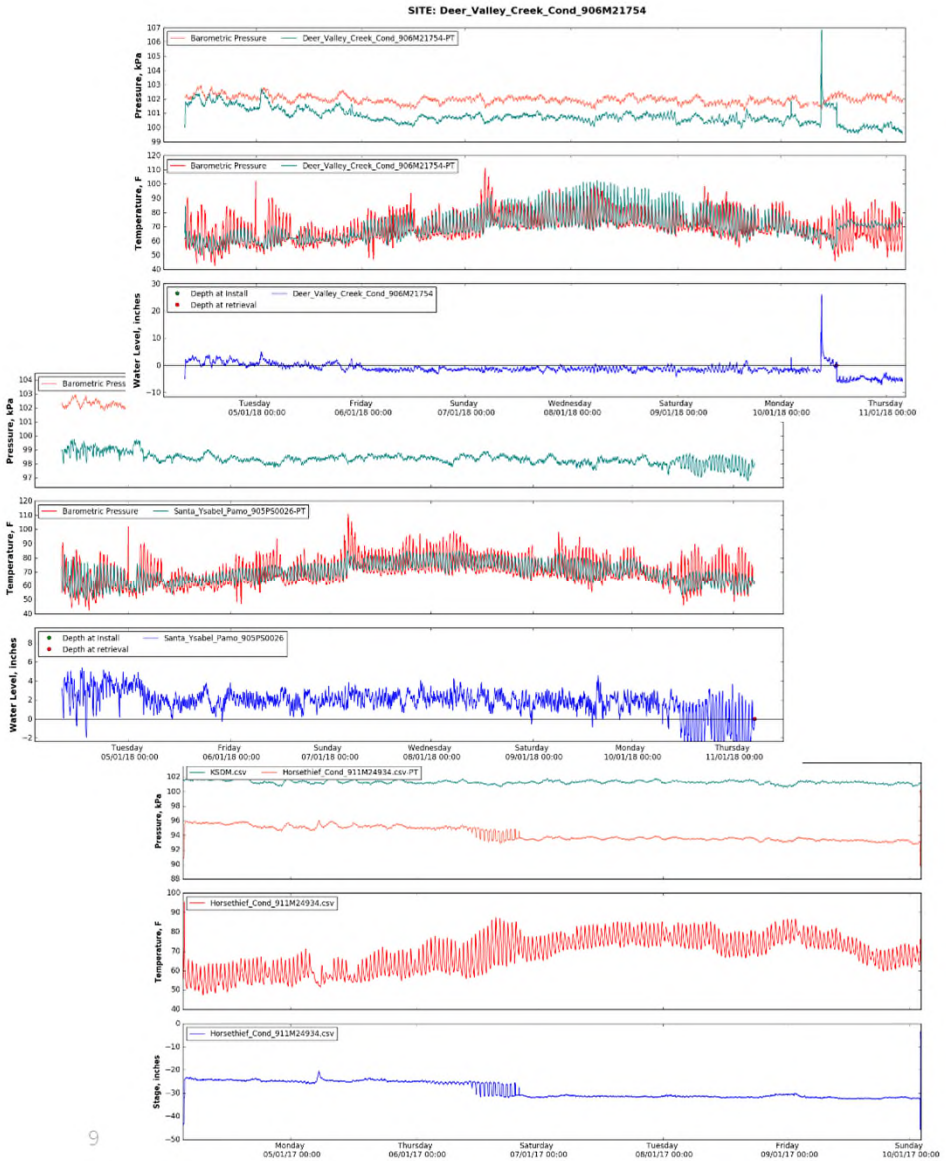
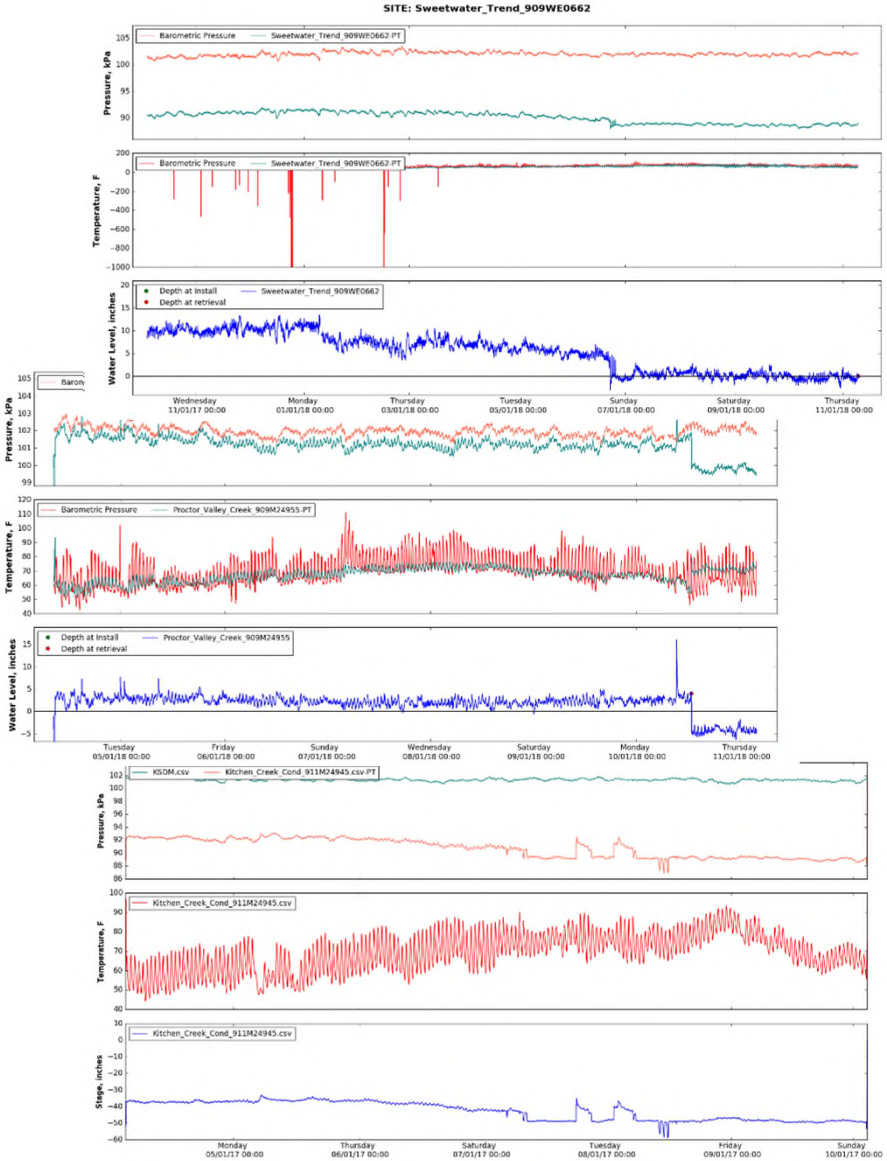


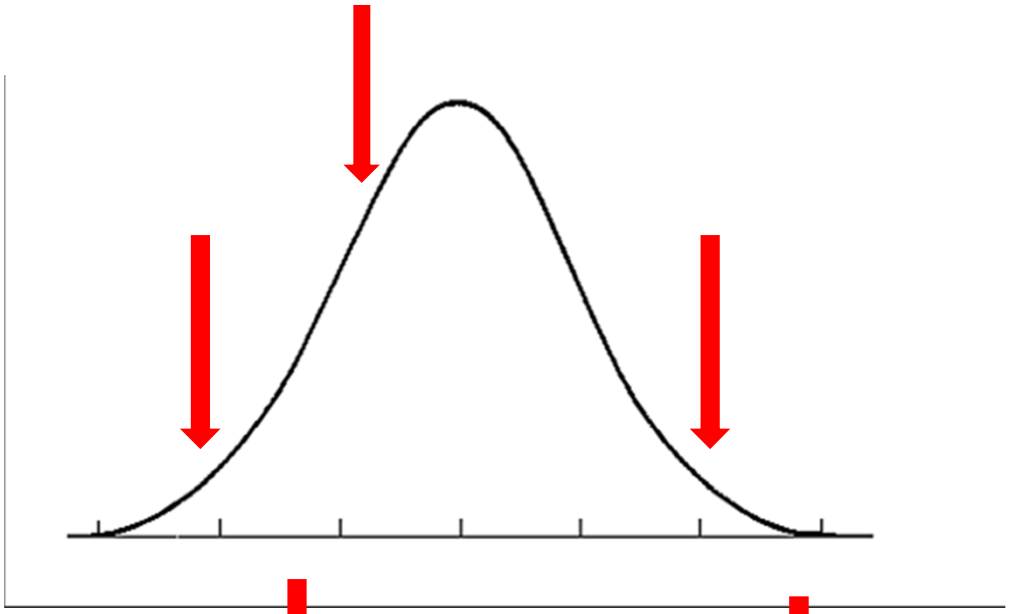
From Mazor et al. (2014)

Typical Intermittent Creek Hydrographs

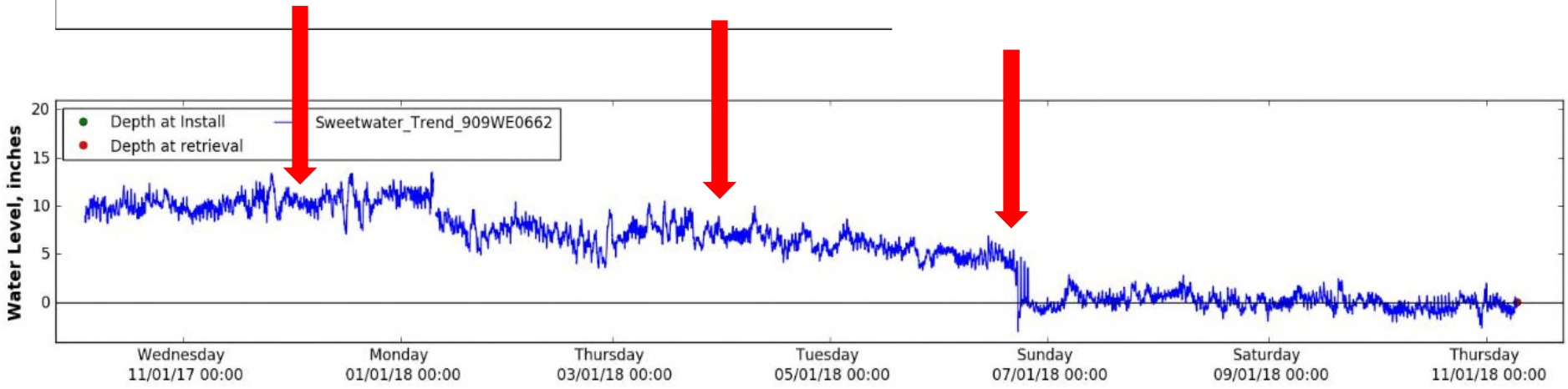




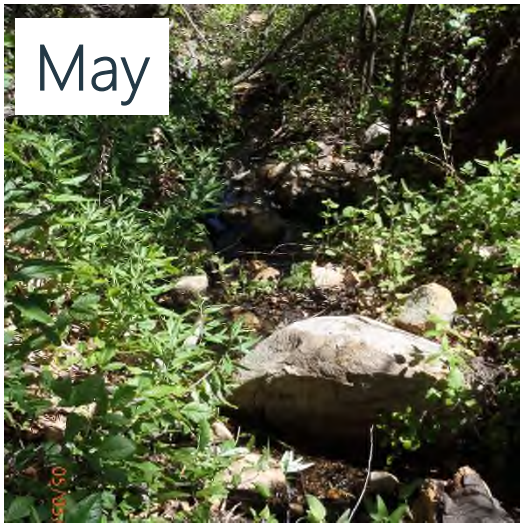
Sampling Intermittent Streams



When is a stream sampled across the flow spectrum?

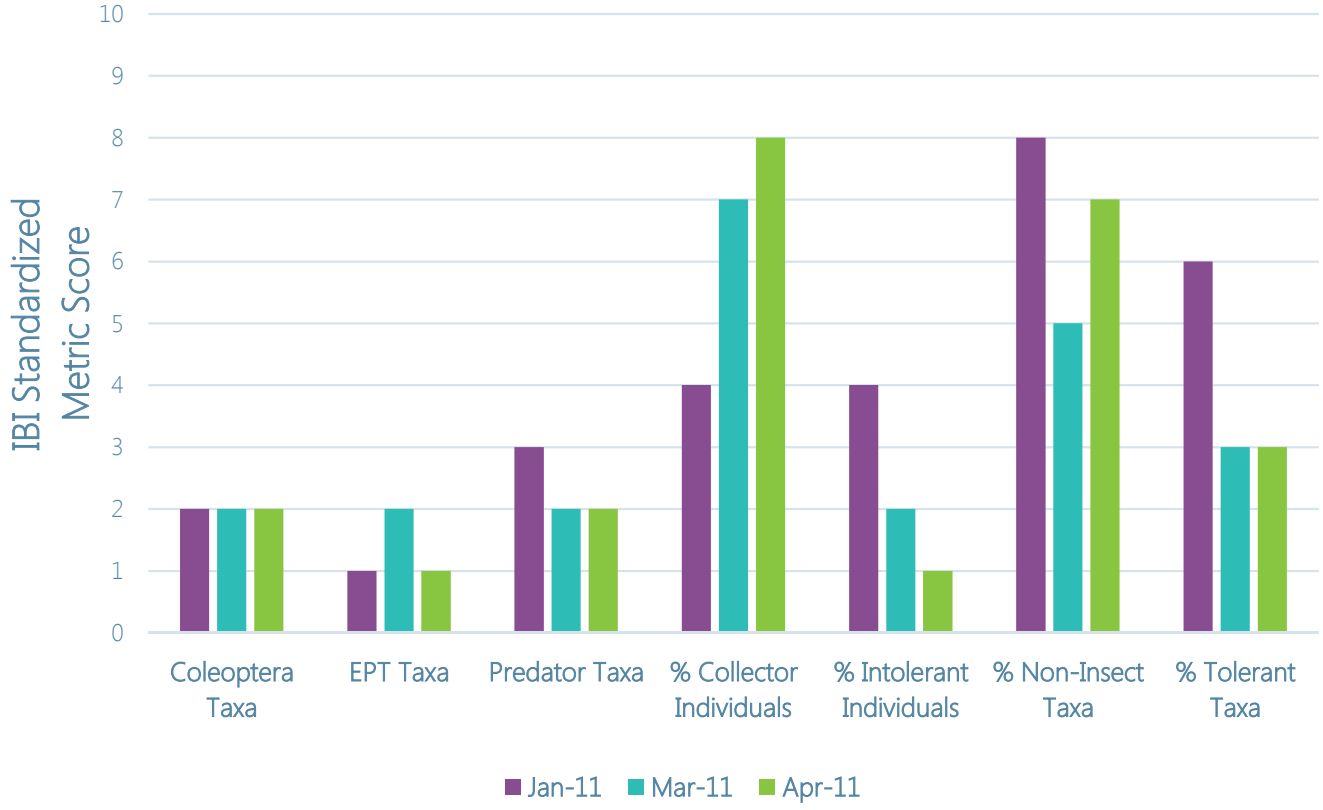


Data from Arroyo Seco Reference 2014



SoCal IBI 82 → 77

Data from Sycamore Creek Reference 2011



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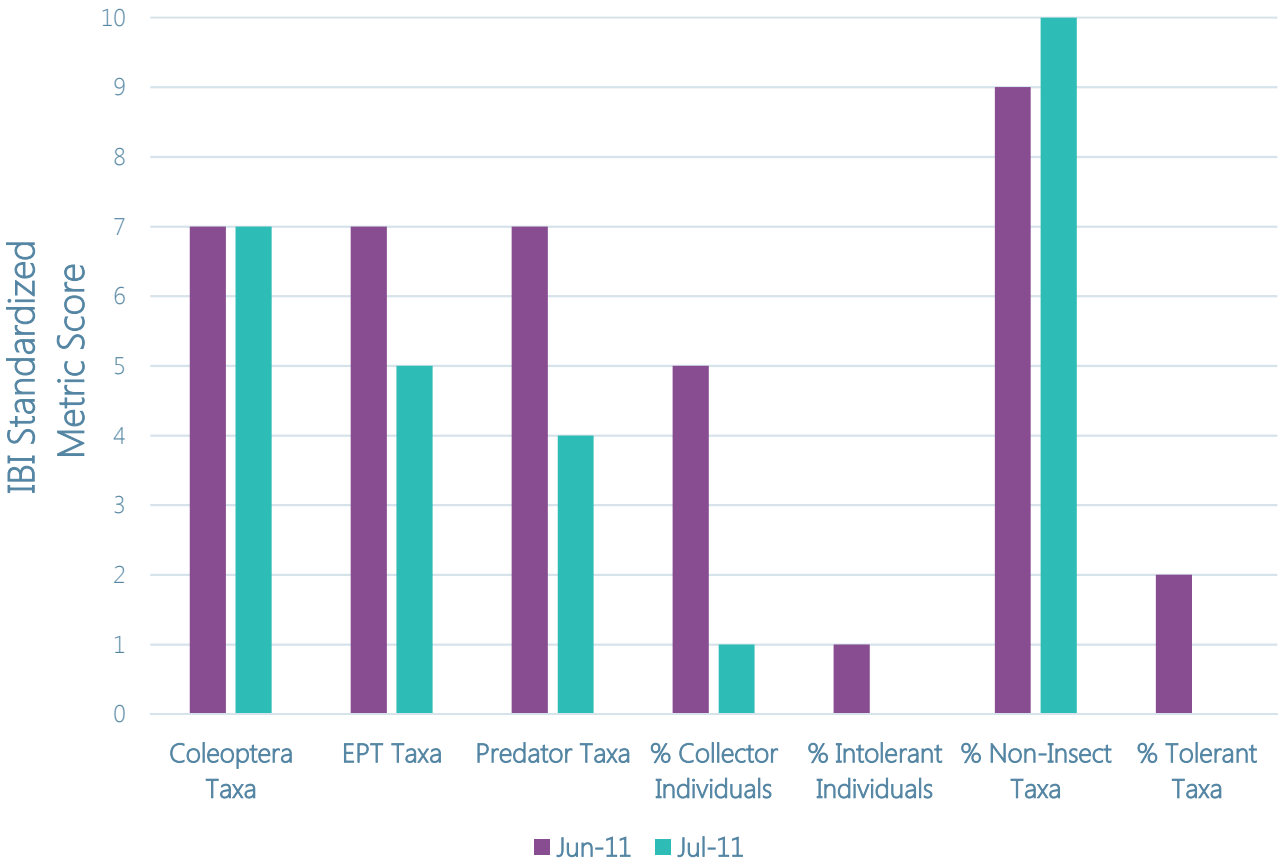
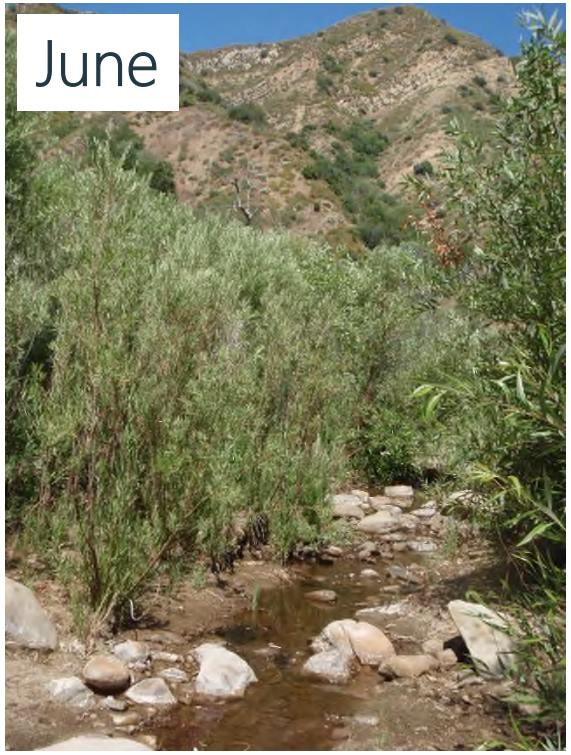
SoCal IBI 40 → 33 → 33

Data from Townsley Creek Reference 2011





SoCal IBI 49 → 33

Ephemeroptera

Ostracods

Boden Creek Reference

- Sampled during waning oligorheic flow during drier year
  - CSCI score 0.82
- Sampled following year during normal base flow
  - CSCI score 1.06
- CSCI scoring system
  - 1.0 mean of all state-wide reference sites
  - <0.79 considered likely impacted

Conclusions

- Studies have shown that the BMI communities in perennial streams are distinct from intermittent systems.
- While research has shown that IBIs can be valid for intermittent streams, when they are sampled is important.
- Some studies have shown that IBI scores can decline as a stream starts to dry, especially in moderately and highly stressed sites.
- Others (including our own) have shown declines in the BMI communities at some reference sites as they dry.
- Considering that most permit-driven sampling occurs near urbanized, higher-stressed areas, how to account for steeper drying associated declines in BMI.
- How far along the spectrum of non-perenniality can benthic macroinvertebrates be used to accurately assess condition?